

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/34968

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : A61C 13/00, 13/08; B29C 35/08; C08F 2/50; C08G 75/04. US CL : 433/199.1, 202.1, 228.1; 264/496; 522/44, 48, 173, 180. According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 433/199.1, 202.1, 228.1; 264/496; 522/44, 48, 173, 180. Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) USPATENTS, DERWENT, EPO, JPO		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,100,929 A (JOCHUM et al) 31 March 1992 (31.03.1992), Abstract, column 2, line 33, to column 3, line 20, column 3, lines 40-55, column 4, lines 26-54, column 5, lines 9-60, column 6, lines 19-37, and Examples 1-3.	1-12
Y	US 5,889,132 A (RHEINBERGER et al) 30 March 1999 (30.03.1999), Abstract, column 2, lines 16-56, column 5, lines 25-35, column 14, lines 13-67, column 25, lines 15-48, column 28, lines 20-50, column 29, lines 16-30, and Example 7.	1-12
A	US 6,384,107 B2 (LIU) 7 May 2002 (07.05.2002), Abstract, column 5, line 56, to column 6, line 56, column 13, lines 18-27, column 14, lines 20-30, column 14, line 62, to column 15, line 16, and Example 5.	1-12
Y	US 6,479,622 B1 (GROSS et al) 12 November 2002 (12.11.2002), Abstract, column 4, lines 15-65, Glossary in columns 5-6, column 7, line 56, to column 8, line 20.	1,2,5
Y	US 6,624,211 B2 (KARIM et al) 23 September 2003 (23.09.2003), Abstract, column 2, lines 59-67, column 3, line 55, to column 4, line 2, column 10, lines 15-40, column 11, lines 13-35, column 13, lines 9-51, Examples 18-33.	1-4
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 10 March 2005 (10.03.2005)		Date of mailing of the international search report 31 MAR 2005
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230		Authorized officer Susan W Berman Jean Proctor Paralegal Specialist Telephone No. 571 272 1700

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US04/34968**C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,554,665 A (TATEOSIAN et al) 10 September 1996 (10.09.1996), Abstract, column 4, line 61, to column 5, line 24, column 5, lines 59-67, column 6, lines 15-23 and lines 39-4.,	1-12

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Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.b of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:

a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

b. format of material

☐

in written format

☐

in computer readable form

c. time of filing/furnishing

☐

contained in the international application as filed

☐

filed together with the international application in computer readable form

☐

furnished subsequently to this Authority for the purposes of search

2. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-12

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-12, drawn to a method of preparing a dental device, comprising shaping a polymerizable thiol-ene mixture and photopolymerizing the shaped mixture.

Group II, claim(s) 13-22, drawn to a dental prosthetic device comprising a polymer obtained from a thiol-ene composition.

Group III, claim(s) 23-30 and 32-34, drawn to a photopolymerizable dental material comprising a filler, thiol monomers, vinyl monomers and an initiator.

Group IV, claim(s) 31, drawn to a dispensing device comprising a photopolymerizable material.

Group V, claim(s) 35-43, drawn to a photopolymerizable mixture comprising a thiol monomer, a vinyl monomer and an initiator.

The inventions listed as Groups I-V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the feature that links the groups of claims is "wherein at least about 10% of the functional groups in the polymerizable mixture are thiol functional groups". This feature does not provide a special technical feature since compositions comprising compounds having thiol functional groups that provide at least 10% thiol functional groups to the compositions are well known in the dental art. See US Patent 5,100,929 or US Patent 5,889,132.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

REC'D 04 APR 2005

PCT

WIPO

PCT

To:
STEVEN C. BRUESS
MERCHANT & GOULD P.C.
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year)

31 MAR 2005

Applicant's or agent's file reference

40281.1WOUI

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US04/34968

International filing date (day/month/year)

22 October 2004 (22.10.2004)

Priority date (day/month/year)

22 October 2003 (22.10.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC(7): A61C 13/00, 13/08; B29C 35/08; C08F 2/50; C08G 75/04. and US Cl.: 433/199.1, 202.1, 228.1; 264/496; 522/44, 48, 173, 180.

Applicant

THE REGENTS OF THE UNIVERSITY OF COLORADO

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
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Alexandria, Virginia 22313-1450

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Authorized officer

Susan W Berman

Telephone No. 571 272 1700

Jean Proctor
Paralegal Specialist

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

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Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

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Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has:
- ☐ paid additional fees
- ☐ paid additional fees under protest
- ☒ not paid additional fees
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
- ☒ not complied with for the following reasons:
- See the lack of unity section of the International Search Report (Form PCT/ISA/210)

4. Consequently, this opinion has been established in respect of the following parts of the international application:
- ☐ all parts.
- ☒ the parts relating to claims Nos. 1-12

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US04/34968

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>1-12</u>	YES
	Claims <u>none</u>	NO
Inventive step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-12</u>	NO
Industrial applicability (IA)	Claims <u>1-12</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and explanations:

Claims 1-12 lack an inventive step under PCT Article 33(3) as being obvious over LIU in view of RHEINBERGER et al. LIN discloses the method steps set forth in the instant claims in column 6, line 22-35. The compositions employed are ethylenically unsaturated monomers and oligomers however, thiol-ene compositions are not mentioned. LIU teaches polymerization by heat and/or light. See Example 5, wherein camphorquinone is used as visible light initiator. RHEINBERGER et al disclose dental materials characterized by silicic acid condensates of norbornene or mercapto silanes that are subjected to thiol-ene polymerization and show only slight polymerization shrinkage and high mechanical strength. It would not have involved an inventive step to employ the compositions comprising thiol-ene materials and photoinitiators taught by RHEINBERGER et al in the method for making a dental prosthesis using polymerization by light disclosed by LIU. One skilled in the art at the time of the invention would have been motivated by an expectation of providing a dental prosthesis having only slight polymerization shrinkage and high mechanical strength, as taught by RHEINBERGER et al.

Claims 1-12 meet the criteria for novelty set out in PCT Article 33(2), because the prior art does not teach the instantly claimed method wherein the compositions is a thiol-ene composition and polymerization is by photopolymerization.

Claims 1-12 meet the criteria set out in PCT Article 33(4), and thus provide industrial applicability because the subject matter claimed can be made or used in industry.